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PATENT SPECIFICATION

668,922

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COMPLETE SPECIFICATION

Improvements in Vehicle Body Framework

We, DAIMLER-BENZ AKTIENGESELLSCHAFT, of Stuttgart-Unterturkheim, Germany, a Company incorporated under the laws of Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement :—

The invention relates to a vehicle-body framework, particularly for large-size vehicles such as omnibuses or the like, and aims primarily at a mode of construction which, for as small as possible an expenditure of material and labour for manufacture and assembly, ensures the best strength properties and high rigidity against twisting.

The invention accordingly resides in this that, in a vehicle with a middle portion, for example containing the side windows, and at least one end portion, the longitudinal floor bearers, extending to the vehicle end portion or into the same, of the middle portion are stiffened against each other at their ends by diagonal bearers and that the diagonal bearers are prolonged beyond the longitudinal bearers to as far as the outer wall or the outer framework of the vehicle end portion for supporting the same. The longitudinal roof bearers are suitably carried downwardly in a bowed shape towards the lower longitudinal bearers at the sides with which, together with transverse stiffening members, they form the outer framework, strutted X-wise by the diagonal bearers, of the vehicle end portion. Advantageously, the bearers all have a hollow profile.

According to a further feature of the invention, whilst conforming with the various requirements for the body mounting of the lower portion and for the window arrangement of the upper portion, transverse bearers or transverse ribs of the framework are preferably so distributed or disposed in the middle portion of the vehicle-body framework consisting of longitudinal and transverse bearers that the lower window columns extending downwardly from the window sills on the one hand and the window bearers located between the windows on the other hand are offset relatively to each other in the longitudinal direction of the vehicle. In this manner, a window division independent of the points of mounting of the body on the chassis frame is achieved. Whereas the body mounting is substantially determined by the arrangement of the vehicle axles or by the necessary intervals between mountings and the arrangement of the lower window columns or transverse ribs suitably depends upon the points of mounting of the body, the window division in, for example, omnibuses is preferably adapted to suit the disposition of the passengers' seats. In the heretofore usual modes of constructions with ring-shaped continuous transverse ribs, such adaptation was not possible.

The invention further provides such a design of the individual bearers and bearer connections that the forces are transmitted by the bearers or transferred from one to another bearer in reliable and appropriate manner. In particular, window portions or side walls are thereby made possible which are capable of taking up the principal vertical loadings of the framework, and also a floor portion which is particularly adapted for the even transfer of the forces to the frame.

For this purpose, the invention primarily makes use of the experience which has been gained in the welding and pressing arts and is particularly based upon the recognition that the production of a body framework from individual short and light structural elements united by welding to form a complete structure not only possesses extraordinary advantages from the production standpoint, but also satisfies the highest demands in respect of the strength properties of the framework.

Accordingly, the invention resides further, in particular, in this that, with subdivision of the bearers into individual bearer sections, the individual sections abut directly against one another and are directly welded together, particularly in such a manner that the bearer sections (in some cases directly welded to one another) of the one bearer extend continuously through the connection point and the bearer sections of the bearer butting

against it or intersecting it are welded laterally to the first bearer sections. The continuous bearers are then preferably widened at the connection points, in the line of the other bearers intersecting them, into a shape favourable for the transfer of the forces and, at the widened parts, are so welded to the latter bearers that these are completed by the widened parts to form bearers which are likewise continuous.

By reason of the use of only short bearer sections, which suitably extend from one connection point to the next or next but one only, it is possible to use small dies and tools for the production of the bearers and to make the assembly handy and labour saving. Above all, however, it also permits of the use of butt welding, which is particularly advantageous for the strength properties of the framework, on a larger scale for the production of the framework, since the short and light structural elements greatly facilitate, or even permit for the first time of, the pressing together of the parts to be welded necessary for the purpose.

These advantages can be utilised and further enhanced in a very special fashion if the bearers or bearer sections are made from individual pressed sheet-metal parts. The bearers or bearer sections can then be readily suited to the required force distribution, with a low weight, by appropriate shaping. Production from two shell-shaped pressed metal halves which are welded together at their edges is particularly advantageous.

In using this mode of construction, the vertical window columns in particular are produced from two pressed metal parts to which the individual bearer sections of the longitudinal bearers running along below and above the windows are butt welded laterally. For this purpose, the window columns are made of I-shape, the widened ends serving for the connection of the short longitudinal-bearer sections extending from one to another window column. For stiffening purposes, reinforcing elements, for example U-shaped elements, may be provided which are arranged in the interior of the hollow bearers, and which penetrate the continuous bearers transversely and are welded to the ends of the laterally applied bearer sections.

In similar fashion, the lower window columns or the vertical pillar parts of the transverse floor bearers or floor ribs are suitably composed of two pressed metal parts. At their lower ends, the two pressed metal parts preferably fork, the one pressed-metal part (suitably the outer) extending beyond the floor transverse bearer as far as to the lower end of the side wall or to a longitudinal bearer closing the side wall below, whilst the other pressed-metal part (suitably the inner) is bent inwardly and serves for the connection to the floor transverse bearer, for which purpose it is for example formed like a foot, embraces the floor transverse bearer of the framework on at least three sides and is welded to it at a rather large distance.

The invention further relates to a design of the connection points of the framework (particularly the floor portion) and also of the welding places provided for the purpose which is particularly suitable for strength and reliability of connection. Preferably, the bearers are welded together at their upper and lower edges only. If use is made of connection pieces, for example in the form of flat plates, which serve for the stiffening of the bearers butting against or crossing each other, the connection pieces are preferably provided with openings at the butt joints, so that the bearers can be welded together at the butt joints located under the connection pieces and, if desired, also in the openings to the connection pieces themselves. The connection pieces, for example an upper and a lower connection plate in each case, are furthermore preferably welded at their ends, at as large a distance as possible from the centre of the connection, to the bearers, the welding being preferably effected to the bearer edges at which the connection plates may be provided with slits or recesses for this purpose.

Such a welded connection of the bearers, particularly bearers composed of pressed-metal parts, gives the advantage that unnecessary heat accumulation at the individual welding points is precluded, since welding is effected at those places only which are important for the strength of the welded joint. Weakening of the thin-walled pressed-metal parts and the distortions and crack formations hitherto frequently caused are thereby avoided, so that a high degree of strength of the individual connection points is achieved.

By employing the measures in accordance with the invention, a framework can be achieved in which all of the structural elements are evenly involved in the force distribution of the bending and twisting forces which arise and the forces are distributed as uniformly as possible over the whole strength structure.

In order to enable the invention to be readily understood, reference is made to the accompanying drawings illustrating one constructional example embodying the present improvements, in which drawings :—

Figure 1 is a side elevation of a body framework suitable for a vehicle such as an omnibus.

Figure 2 is a horizontal section on the line 2–2 of Figure 1 and a plan of the floor members of the framework.

Figure 3 is a front elevation and Figure 4 a rear elevation of Figure 1.

Figure 5 is an elevation to a larger scale and as seen from the interior, of portions of upper and lower side longitudinal members and a skirting longitudinal member, and a side vertical member or rib, a transverse floor member being seen in section.

Figure 6 is a view as seen from the left-hand side of Figure 5.

Figure 7 is an elevation to a still larger scale and as seen from the outside, of window columns of I-form rising from the upper longitudinal member of Figures 5 and 6 and extending upwards to a top longitudinal side member, a roof bow member being shown extending upwards from the top side member to a roof longitudinal member.

Figure 8 is a view of some of the parts as seen from the left-hand side of Figure 7.

Figure 9 is a vertical transverse section taken on the line *a–a* of Figure 7.

Figure 10 is a perspective view to a larger scale of one of the junctions between floor members seen in Figure 2, and

Figure 11 is a perspective view, also to a larger scale, of another of the junctions seen in Figure 2.

The omnibus body framework in Figure 1 may be said to comprise three longitudinal parts, A indicating the forward section, B the middle section and C the rear section. In Figure 2, the floor part of the framework is indicated by D. The components of the framing are hollow or tubular members of sheet metal or members composed of pressed sheet metal parts. The middle section B comprises the greater portion of the length and contains the side window openings. This section includes roof longitudinal members 1, top side longitudinal members 2, upper side longitudinal members 3 at window sill level, lower side longitudinal members 7 and a skirting longitudinal member 8. Between the longitudinals 3 and 2 on one side there extend five window columns 4 and between the longitudinals 2 and 1 there extend roof bows 6 which may, as shown, be aligned with and prolonged from respective window columns 4. The columns 4 and bows 6 brace together the respective longitudinals and their spacing apart is determined by the width of the window openings. The longitudinals 1 are made from tube of rectangular cross section, as may be seen from Figures 7 to 9, and they and the longitudinals 2 extend continuously above the window openings and beyond the end columns 4, their end portions being bent downwardly towards the floor as seen in Figures 1, 3 and 4.

The longitudinals 3 and 7 are connected together by vertical ribs 5 which, as shown, may be extended downwardly for connection also to the skirting member 8. There are six ribs 5 in the side of the frame seen in Figure 1 and of these the four intermediate ones are offset from the window columns 4 and only the two end ones are aligned with the end window columns.

The longitudinals 2 and 3 and also the columns 4, bows 6 and ribs 5 may all be composed of pressed sheet metal parts. As will be understood from Figures 5 to 9, each of these parts may consist of two flanged shells pressed from sheet metal and connected together to form a hollow member.

The lower longitudinals 7 are for the support of the flooring and form part of the floor frame, and they may comprise lengths of tubing of rectangular cross section welded in between the ribs 5. The skirting member 8 which completes the side formation may be of angle iron.

The front section A and the rear section C in Figure 1 are constituted predominantly of tubes of rectangular cross section. The front corner columns 9 are preferably made from pressed sheet metal parts.

The floor section D, Figure 2, is composed essentially of continuous transverse members 10, inner longitudinals 11 and end diagonals 12, all these being preferably of rectangular cross section tubes produced by welding or drawing. These intersect or cross or abut at junctions 13, 14, 15 and 16. The junctions 14 for the diagonals 12 are stiffened one against another by transverse members 17.

Referring to Figures 5 and 6, it will be seen that each of the ribs 5 consists of two pressed metal shells with flanges, the outer shell part 18 being continued, with the same cross section, beneath the longitudinal 7 down to the skirting 8. The inner shell part 19, as viewed in Figure 6, is widened at its lower end to provide a foot formation. Side portions depending from the foot embrace the end portion of a transverse floor member 10 which extends through to the shell part 18. The foot and its side depending portions are welded to the floor member 10 by individual strips of welding as indicated in Figure 6. In the upper part of the ribs 5, the two shell parts are united by the spot welding of their flanges 20 to form a closed section hollow member, the section being shown in Figure 6. At its upper end, the rib 5 is formed with projections 21 for enabling such upper end to be welded securely to the longitudinal 3 which is overlapped by the projections 21. The ends of the tubular lengths constituting the longitudinal 7 and the ends of the transverse floor members 10 are butt-welded to the outer shells 18 of the ribs 5, the top surfaces of the longitudinals 7 and transverse members 10 being at the same level.

Referring to Figures 7 to 9, the window columns 4 are of I-form as viewed in Figure 7 and each consists of two similar and symmetrical flanged shell parts 22 and 23 con-

nected together by the spot welding of their meeting flanges 24 to form a hollow member of the cross section shown in Figures 8 and 9. The head and foot of the I-form are widened or increased in depth to conform to the cross sections of the longitudinals 2 and 3 with which they are aligned, and the corners are radiused where the horizontal head and foot join the vertical stem.

As aforesaid, the longitudinals 2 and 3 are composed each of two flanged shell parts and the flanges by which the parts are welded together are indicated at 25 in Figure 7. The said longitudinals 2 and 3 are in lengths and each of the separate lengths has its end abutted against one end of a respective head or foot of a column 4, the parts being connected together by butt welds 26, Figure 7. For additional security, particularly against lateral buckling, the butt joints may be reinforced by internally disposed U-section bars 27 suitably welded to the appropriate parts. In the example illustrated, there are top and bottom reinforcing bars 27 within the foot of the column 4, the end portions of these bars extending into the adjacent lengths forming the longitudinal 3. Within the head of the column 4 there is only one bar 27 disposed at the bottom of the cross section and with its ends extending into the adjacent lengths of the longitudinal 2. The top of the said head is removed to accommodate the widened foot of a roof bow 6, which foot is welded at 28 to the said head and to the top of the longitudinal 2. The bow 6 is composed of two flanged shell parts connected together by the welding of its flanges and it has a widened horizontal head portion as well as a foot portion, the corners being radiused as in the case of the column 4 with which it is aligned. The head portion of the bow 6 is welded to a roof longitudinal 1, as indicated in Figure 7. Beneath the window openings the framing is provided with a sheet metal sheathing 29 which is welded to the longitudinal 3 and other appropriate parts.

Referring again to Figure 2, the continuous transverse members of the floor frame extend from one side longitudinal 7 to the other and intermediately they intersect inner longitudinals 11, these latter being made up of a number of lengths each length having its ends abutted against transverse members. The diagonals 12 reinforcing and bracing the forward and rear ends of the floor frame also are composed of short lengths having their ends abutted some against end transverse members 10, some against the intermediate transverse members 11, and some against the short end transverse members 17. Thus, the junctions 13 are formed where the members 10 and 11 intersect, junctions 14 are formed where the ends of the members 17 meet the diagonals 12, junctions 15 are formed where diagonals meet the members 11, and junctions 16 are formed at the intersections of the diagonals and the transverse members 10. Figure 10 illustrates in detail the construction of one of the junctions 16. For this purpose junction pieces, which may be of plate form, present arms or extremities for overlying and underlying the several lengths forming the diagonals 12 and which lengths are abutted with one end against the transverse member 10 at this junction. The junction plates due to their symmetrical formation are simple and inexpensive to produce. The arms or extremities of the said plates are welded at 30 to the hollow or tubular diagonals 12 such welding being performed by strips of welding and by the formation of appropriate cuts or recesses at these places. As will be seen, each of the abutting parts 12 is connected in the horizontal direction only and at the top and bottom surfaces by narrow strips of welding within the width of the profiles of the hollow bodies. Two parallel slits 31 are formed in each of the junction plates and these permit of welding the said plates to the transverse member 10 and the diagonal parts 12 to the transverse member 10 thus completing the junction. At the same time, the slits 31 also permit of further welding of the diagonals 12 to the junction plate. The welding points 30 are situated as distant as possible from the centres of the junction plates.

Figure 11 illustrates in detail the junctions 13 in Figure 2 at the intersections of the transverse members 10 with the inner longitudinals 11. The mode of effecting this junction is very similar to that described with reference to Figure 10, excepting that in Figure 11 two of the arms of each of the top and bottom junction pieces or plates have their extremities joined by strip welds at 30 to the transverse member 10, the extremities of the other two arms being joined by strip welds at 30 to two lengths of rectangular section tube forming part of a longitudinal 11 and these welds being disposed at a suitable distance from the points at which the ends of the said lengths abut against the sides of the transverse member 10. Suitable recesses or cuts are provided at the places where the strip welds 30 are made. Each of the junction plates is formed with parallel slits 31 and these enable the said plates to be welded to the members 10 and 11 as well as enabling such members to be welded together.

In the junctions in Figures 10 and 11, the shape and manner of attachment of the junction plates on both the upper and lower sides ensures the attainment of an even and gradual distribution of forces over the outer fibres of the joint structure, so that the forces

are transmitted uniformly over the whole frame structure.

What we claim is :—

1. Vehicle body framework comprising side parts with window openings and a floor frame part, characterized by the fact that inwardly disposed longitudinal members of the floor frame in the end portions of the framework are stiffened and braced against each other by diagonals which are extended beyond the said longitudinal members to outer parts of the framework for supporting such parts.

2. Vehicle body framework as claimed in claim 1, wherein roof longitudinals and upper side longitudinals are extended to the front and rear extremities of the vehicle their end portions being bent downwardly in bow formation so as to constitute the outer framework parts which receive support from the diagonals.

3. Vehicle body framework as claimed in claim 2, wherein intermediate longitudinals, extending along respective sides at window-sill level, do not extend into end portions of the framework.

4. Vehicle body framework as claimed in claim 3, wherein two top longitudinals on each side and two bottom longitudinals on each side are extended to form end portions of the framework.

5. Vehicle body framework as claimed in claim 1, wherein the stiffening and bracing by the diagonals is enhanced by the diagonal systems being intersected by transverse members of the floor frame.

6. Vehicle body framework as claimed in claim 1 or claim 5, wherein the front and rear end portions of the framework are strengthened by similar diagonal systems in the floor frame.

7. Vehicle body framework as claimed in any one of the preceding claims, wherein window column members extending above sill level and side rib members extending up to sill level are offset from one another in the longitudinal direction.

8. Vehicle body framework as claimed in claim 7, wherein the window column members connect side longitudinals at sill level with roof longitudinals and the side rib members connect such side longitudinals with floor frame longitudinals.

9. Vehicle body framework as claimed in claim 7 or claim 8, wherein the window column members are joined at their upper ends to roof transverse members and the side rib members are joined at their lower ends to floor frame transverse members.

10. Vehicle body framework as claimed in claim 9, wherein the window column members, roof transverse member, side rib members and floor frame transverse member at each end are aligned with one another.

11. Vehicle body framework as claimed in any one of the preceding claims wherein longitudinal, transverse and diagonal members are hollow, as for example of box section.

12. Vehicle body framework as claimed in any one of the preceding claims wherein certain frame members are composed of a number of lengths which are butt welded to one another or to a member intersecting them so that they may be said to extend continuously through the junctions.

13. Vehicle body framework as claimed in any one of the preceding claims, wherein certain members such as window columns and their upward extensions are widened at their points of intersection with other members, the widened parts being so formed that when the welding at the points of intersection is completed the intersected members are practically continuous through the intersection.

14. Vehicle body framework as claimed in claim 13, wherein short lengths are used for the formation of longitudinal and transverse members, such lengths extending only from joint to joint, or from one joint to the next but one.

15. Vehicle body framework as claimed in claim 14, wherein longitudinal members are composed of a number of lengths which are welded to the sides of transverse members against which they are abutted.

16. Vehicle body framework as claimed in any one of the preceding claims, wherein at least one of the frame members is composed of pressed sheet metal parts.

17. Vehicle body framework as claimed in claim 13, wherein the members formed with widened parts are composed of pressed sheet metal parts.

18. Vehicle body framework as claimed in claim 14, wherein any short length to be welded to the side of another member is composed of pressed sheet metal parts.

19. Vehicle body framework as claimed in any one of claims 16 to 18, wherein any fabricated member or part is composed of two pressed sheet metal shells each of which forms one half of such member or part.

20. Vehicle body framework as claimed in claim 19, wherein the sheet metal shells are of flanged U-section.

21. Vehicle body framework as claimed in any one of claims 14 to 20, wherein lengths composing frame members are butt welded.

22. Vehicle body framework as claimed in claim 15, wherein the side longitudinal members of the frame defining the tops and bottoms of the window openings are composed of a number of lengths which are welded at their ends to the sides of the window columns.

23. Vehicle body framework as claimed in claim 22, wherein the window columns are

of I-shape the widened head and foot portions having formations for connection thereto of the ends of respective lengths of the longitudinal members.

24. Vehicle body framework as claimed in claim 23, wherein upward prolongations of the window columns form part of roof bows and connect between the longitudinal at the top of the window opening and a roof longitudinal set inwardly from the side of the framework.

25. Vehicle body framework as claimed in any one of the preceding claims, wherein frame members welded to frame members intersecting them are reinforced by pieces welded to their interior and extending into the intersecting members.

26. Vehicle body framework as claimed in claim 25, wherein the reinforcing pieces are U-section metal bars.

27. Vehicle body framework as claimed in any one of the preceding claims, wherein ribs beneath the window openings consist each of two pressed sheet metal parts which fork or diverge at their lower ends, one part extending beneath the floor frame to a skirting and the other extending inwardly and serving for connection to a transverse member of the floor frame.

28. Vehicle body framework as claimed in claim 27, wherein the inner rib part is given a foot-like formation at its lower end, this formation being adapted for embracing a transverse member of the floor frame and for being extensively welded to the latter.

29. Vehicle body framework as claimed in any one of the preceding claims, wherein the ends of separate lengths constituting a frame member are abutted against a continuous frame member and are welded thereto at the top and bottom surfaces of such members.

30. Vehicle body framework as claimed in claim 29, wherein the butt welded joints are stiffened by top and bottom junction pieces welded on the abutting parts.

31. Vehicle body framework as claimed in claim 30, wherein the junction pieces are formed with one or more openings or slits which permit of the welding together of the frame members covered by the junction pieces or plates.

32. Vehicle body framework as claimed in claim 31, wherein abutting frame members are welded to one another and also to the junction pieces or plates through the said openings.

33. Vehicle body framework as claimed in claim 30 or claim 31, wherein the junction pieces are in the form of flat plates placed above and beneath the junctions.

34. Vehicle body framework as claimed in any one of claims 30 to 33, wherein two or more abutting frame members or parts thereof are simultaneously welded together or to the junction pieces.

35. Vehicle body framework as claimed in any one of the preceding claims wherein junction pieces for joints between abutting frame members or parts thereof present extremities which are welded to the said frame members or parts at as large a distance as possible from the centres of such junction pieces.

36. Vehicle body framework as claimed in claim 35, wherein the extremities of the junction pieces are provided with recesses suitable for the application of the welding seams.

37. Vehicle body framework as claimed in any one of claims 31 to 36, wherein the junction pieces are welded to the frame members or parts thereof both at the extremities of the junction pieces and at the butt joints between the frame members or parts thereof.

38. A body framework suitable for a large vehicle with windows, e.g., an omnibus, said framework being constructed from parts assembled and welded together substantially as hereinbefore described with reference to the accompanying drawings.

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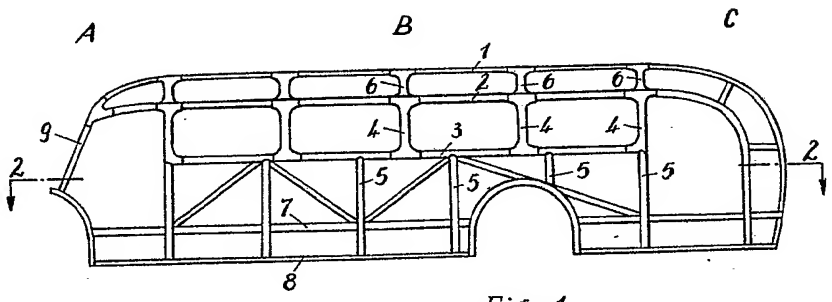

Fig. 1.

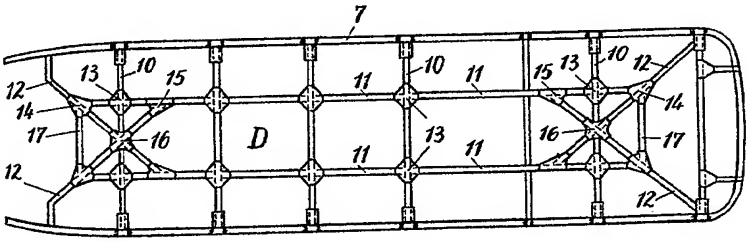

Fig. 2.

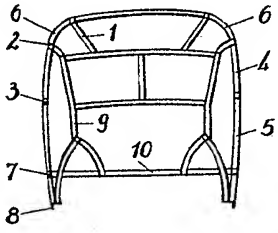

Fig. 3.

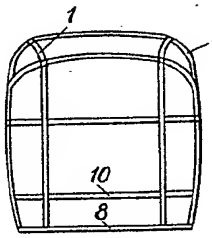

Fig. 4.

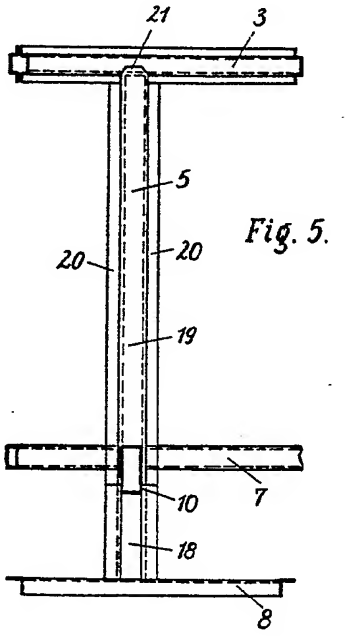

Fig. 5.

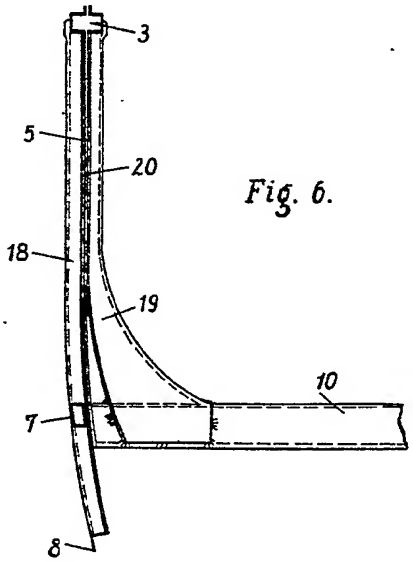

Fig. 6.

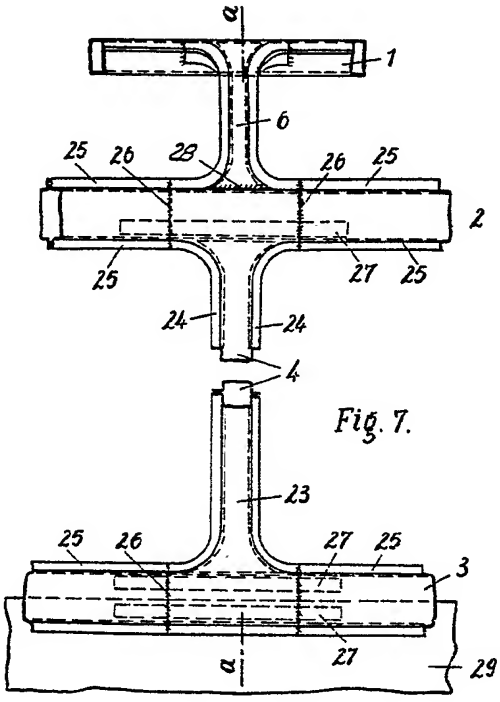

Fig. 7.

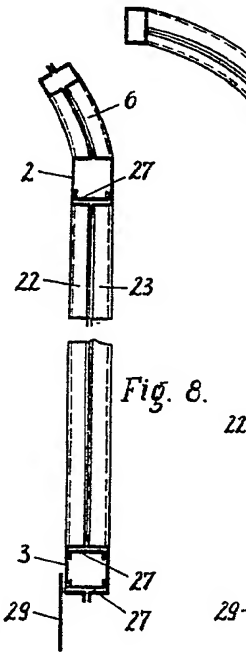

Fig. 8.

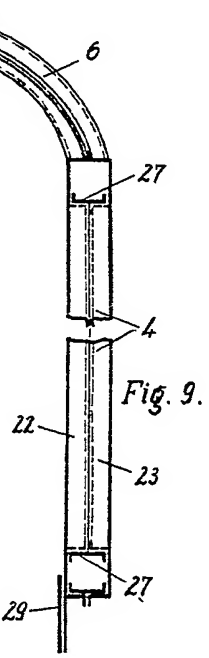

Fig. 9.

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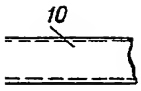

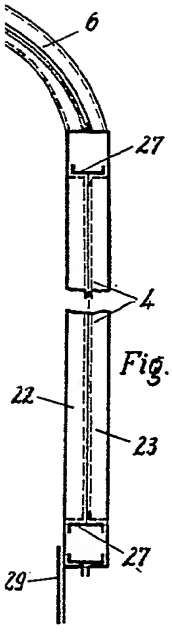

Fig. 9.

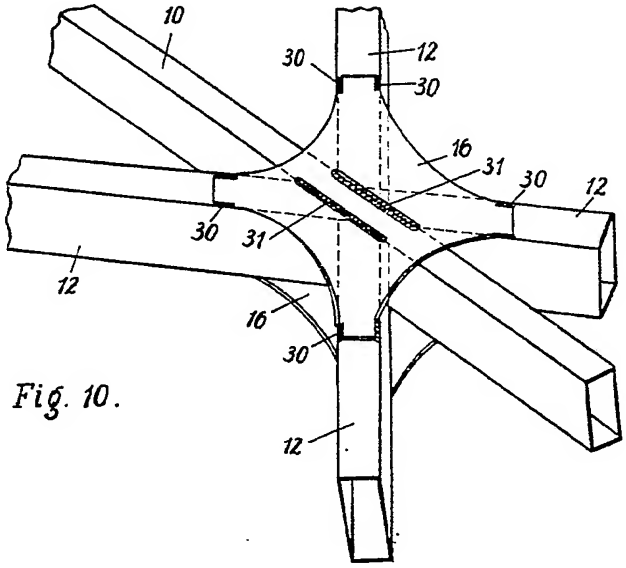

Fig. 10.

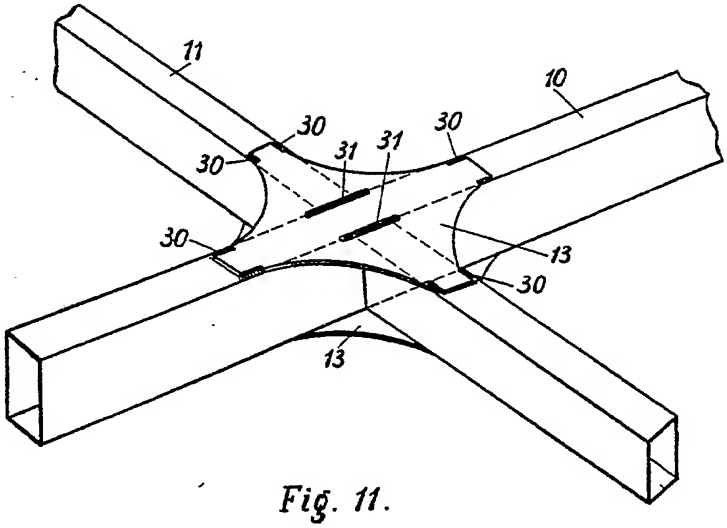

Fig. 11.

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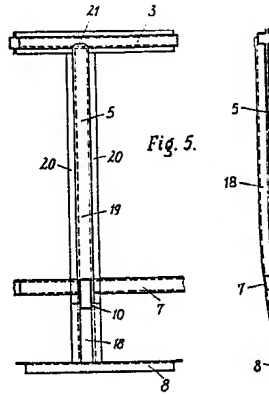

Fig. 5.

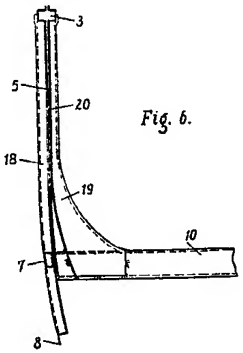

Fig. 6.

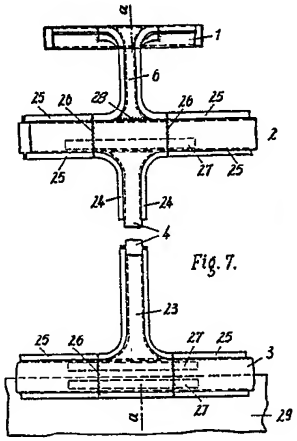

Fig. 7.

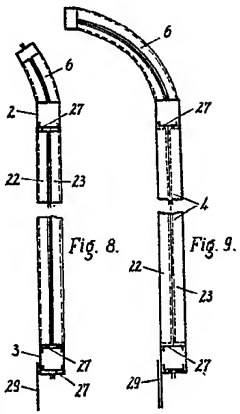

Fig. 8.

Fig. 9.

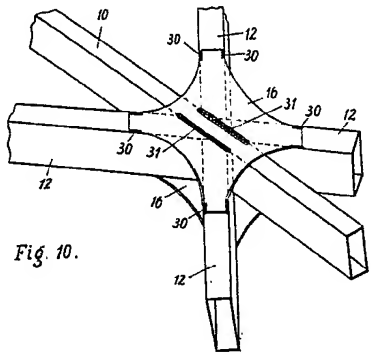

Fig. 10.

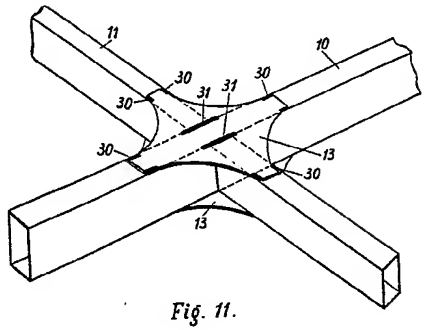

Fig. 11.

H.M.S.O. (M.F.P.)